

U.S. Serial No. 09/921,921
Amendment
Reply to OA dated Sept. 10, 2004

Atty. Docket No. 740819-595

REMARKS

The rejection of claims 4, 5 and 8-10 under 35 U.S.C. § 102(b) and § 103 has been obviated by canceling these claims, and replacing them with new claims 11-25 which more clearly distinguish the invention from the prior art of record. However, before the specific language of the new claims is discussed, a brief recap of the principal features and advantages of the invention will be made so that the language used in the Amendment may be more fully appreciated.

The claimed invention stems from the inventors' observation that when a resist film is irradiated with an electron beam, the outgases released from the resist film can absorb the energy of the electron beam in such a way as to degrade the accuracy of the desired lithography. The invention solves this problem by providing a mechanism which not only removes the outgases, but collects them so that they may be analyzed to determine the kind and quality of impurities present. The results of the analysis may be used to enhance the accuracy of the lithography.

New claim 11 expressly recites the collection step of the invention. Specifically, new claim 11 recites an "outgas collection method" that comprises the steps of holding a substrate in which a resist film is formed, irradiating the resist film with an electron beam, "collecting an outgas at a collection unit connected to [an] exposure chamber;" and "absorbing said outgas at said collection unit," wherein, "wherein the outgas is "released from said resist film when said resist film is irradiated" with said electronic beam.

None of the references of record either discloses or suggests the invention recited in new claim 11. For example, the Kazuoki '343 patent discloses only the use of a discharge pump 4 in a device for producing an optical recording medium. In the last Office Action, the Examiner asserts that the English abstract of this reference states that "gases: are collected through the pump 4 ..." However, nowhere does the English abstract of the Kazuoki '343 patent make such a statement, or even use the word "collected" or "collects." Instead, the '343 patent only discloses the use of a pump 4, which it expressly designates as a "discharge" pump, for removing gases during the irradiation of an optical recording medium. Moreover,

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there is no disclosure nor suggestion of the specifically recited "collection unit" of new claim 11. For all these reasons, the Kazuoki '343 patent simply does not disclose or remotely suggest the specifically recited steps of "collecting an outgas at a collection unit connected to said exposure chamber;" and "absorbing said outgas at said collection unit ...". For all these reasons, new claim 11 is clearly patentable over the Kazuoki '343 patent.

New claim 11 is further patentable over Takashi '566 patent. All this patent discloses is a method and device for analyzing the amount of nitrogen in a metal by irradiating the metal with an electron beam to release the nitrogen, and then removing the nitrogen by means of a vacuum pump for analysis. Hence, this reference is not in the least concerned with the specifically recited steps of claim 11 of "holding, at a lower side of an exposure chamber under vacuum, a substrate on which a resist film is formed." In fact, the '566 patent is completely irrelevant to electron beam lithography in general; it uses an electron beam merely to fuse a metal sample in order to release nitrogen. For this reason alone, new claim 11 is clearly patentable over the Takashi '566 patent.

Nor is new claim 11 rendered "obvious" under 35 U.S. C. § 103 in view of any tenable combination of the Kazuoki '343 and Takashi '566 patents. Neither of these references is remotely concerned with the problem that the invention is directed to, *i.e.* the removal and collection of outgases formed during an electron lithography process so that the results of an analysis of the collected outgases may be used to enhance the accuracy of the lithography. As pointed out before, the Kazuoki '343 patent is concerned only with the discharge of gases generated during the irradiation of substrates of an optical recording medium; it is completely silent to the notion of collecting the discharged gases. The main teaching of this reference is that the use of an electron beam, in contrast to an ion beam, shortens the time for preparing the optical recording medium and saves energy. The discharge of the resulting gases is a mere incidental disclosure that appears to be made solely for the purpose of maintaining a vacuum inside the vacuumed vessel, as indicated by the first sentence of the Abstract as follows:

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"Purpose: To shorten the time for operations and to save energy by irradiating a substrate consisting of [organic] matter with an electron beam while evacuating the inside of a vacuumed vessel."

While the Takashi '566 patent is generally concerned with the use of an electron beam to melt a sample in order to release nitrogen for later analysis, it is not in the least concerned with electron beam lithograph or the problem which the invention solves. Simply stated, there is simply no motivation, incentive or teaching in either of these references that would lead a person of ordinary skill in the art to combine the pump and analyzer of the Takashi '566 patent with the irradiation chamber of the Kazuoki '343 patent, as there is absolutely nothing in the Kazuoki '343 patent to suggest the desirability of collecting the gases discharged from the irradiation chamber for analysis or any other purpose. And even if such a combination was supportable under § 103, the resulting device would still not render new claim 11 unpatentable, as claim 11 is specifically concerned with the irradiation of a resist film. By contrast, no such resist film is disclosed anywhere in either of these two references. Hence the Examiner has failed to establish even a *prima facie* case of obviousness. For all these reasons, new claim 11 is patentable over the Kazuoki '343 and Takashi '566 patents, taken singly or in combination.

Claim 12 is patentable not only by reason of its dependency upon claim 11, but for its recitation that the collection unit "has an absorption agent." By contrast, neither the Kazuoki '343 nor the Takashi '566 patents discloses such a recitation.

New claim 13 is likewise patentable at least for the reasons given with respect to new claim 11. New claim 13 not only recites the step of irradiating a resist film with an electron beam, and collecting an outgas at a collection unit connected to the exposure chamber, but further recites the steps of "collecting an outgas at a collection unit connected to said exposure chamber," and "absorbing said outgas at said collection unit," and "analyzing a plurality of constituents of absorbed outgas at an analysis unit ..." By contrast, the Kazuoki '343 patent disposes none of these steps, and the Takashi '566 patent discloses only

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analyzing one constituent, *i.e.* nitrogen gas. For all these reasons, new claim 13 is clearly patentable over the prior art of record.

Claims 14, 15, and 16 are each dependent upon new claims 13, and are hence patentable at least for the reasons given with respect to new claim 13.

New claim 17 likewise recites the step of holding a substrate on which a resist film is formed, as well as irradiating the resist film with an electron beam. This claim further recites the step of "analyzing a plurality of constituents of an outgas, wherein said outgas is released from said release film when said release film is irradiated ..." Hence, new claim 17 is patentable for substantially the same reasons given with respect to claim 13, *i.e.*, not only does it recite the step of analyzing an outgas, but "a plurality of constituents" of an outgas, a step not even remotely hinted out in the Takashi '566 patent. Accordingly, new claim 17 is clearly patentable.

Claim 18 is dependent upon claim 17, and is patentable at least by reason of such dependency.

Claim 19 recites, in apparatus terms, the same limitations as method claims 11 and 12. Specifically, new claim 19 recites "a collection unit connected to said exposure chamber, wherein the collection unit has an absorption agent." Accordingly, new claim 19 is patentable for all the reasons given with respect to method claim 12.

Claims 20 and 21 are dependent upon new claim 19, and hence are allowable at least by virtue of such dependency.

New claim 22 recites not only a collection unit and an analysis unit connected to the exposure chamber, but further recites that an outgas released from the recited resist film is collected in the collection unit, and "a plurality of constituents of said outgas are analyzed at said analysis unit." Accordingly, new claim 22 is patentable for all the reasons given with respect to claim 13.

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Claims 23, 24, and 25 are each dependent upon new claim 22, and are patentable at least by reason of such dependency.


New claim 26 likewise recites an exposure chamber and an analysis unit, and "wherein a plurality of constituents of an outgas released from said resist film when said resist film is irradiated with said electron beam or analyzed at said analysis unit." Accordingly, new claim 26 is patentable for all the reasons given with respect to new claim 22.

Finally, as claims 27, 28, and 29 are each dependent upon new claim 26, these claims are likewise patentable by reason of such dependency.

Now that all the claims are believed to be patentable, the prompt issuance of a Notice of Allowance and Issue Fee Due is hereby earnestly solicited.

The Commissioner is authorized to charge any overage or shortage of fees connected with filing of this Amendment to Deposit Account No. 19-2380 (740819-595).

Respectfully submitted,


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